Re: Question for William Mook

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- *From*: Monkey Clumps <spacebrain71@xxxxxxxxx>
- *Date*: Sat, 22 Dec 2007 07:34:50 −0800 (PST)

On Dec 22, 12:11 am, Williamknowsbest <William.M...@xxxxxxxxx> wrote:

> On Dec 22, 12:38 am, Monkey Clumps <spacebrai...@xxxxxxxxx> wrote:
>
>> On Dec 19, 8:38 am, Monkey Clumps <spacebrai...@xxxxxxxxx> wrote:
>>
>>> I know that you intend to use CPV system to generate
>>> hydrogen rather
>>> than sell electrical energy to the grid. However, I am curious
>>> if the
>>> hydrogen end of things didn't pan out, what sort of cost
>>> would you
>>> have for kWh? Are there technical issues such as energy
>>> storage and
>>> power demand vs. insolation that make selling to the grid
>>> impractical
>>> for you? I would think wind energy would have the same
>>> issues since
>>> you can't control when the wind blows. Maybe the issue is
>>> converting
>>> the DC from you solar system to high voltage AC? You
>>> have been
>>> talking about plant costs of $.07 per peak watt, which seems
>>> to be way
>>> below any other type of power plant, including coal or gas.
>>> Even if
>>> your cost doubled to convert to grid AC it seem you would
>>> still be way
>>> ahead of the competition.
>>>
>>> I think your plans for hydrogen are exciting, but would a
>>> more
>>> straight forward approach for you be to buy some cheap
>>> desert land

somewhere between LA and Las Vegas, build a giant CPV farm and just
sell the electricity to the grid? California could certainly use the
power on hot sunny days.

So after writing pages and pages about your CPV invention, now you clam up? If my suggestion is stupid let me know. It seems like an obvious question since the keystone of your plan was low cost production of electricity from solar. As Dan Lancaster says electricity has far higher "exergy" than hydrogen. So why not just sell the electricity? What up dog?− Hide quoted text −

− Show quoted text −

I didn't clam up − I was busy replying to the tons and tons and tons pointless argumentation you and the other stooges have been dumping on me here as you persistently oppose any attempt of mine to teach you a little about aircraft design principles! lol. I also have other stuff I'm doing − even before Christmas.

Your question is a common one and has been answered before − though its been a while since anyone has asked it. I might have someone put up a web page on it since it is such a common question.

The answer revolves around balance of system costs and their impact on solar power costs.

Recall, that my goal is to produce low−cost energy that's competitive and to do that with sunlight you have to reduce capital costs to a minimum, since on Earth, they're in the dark most of the time.

So, here's my setup to produce hydrogen;

solar panel −−> DC power −−> variable load electrolyzer −−−> hydrogen

Now, solar panels produce electricity in response to sunlight. That means the power they make changes with lighting conditions. Now, any electrical generator must feed its energy into a matched load. If not you have problems. Brownouts, short circuits etc.

This means that the amount of energy you make with a solar panel, aka the power level of the generator, varies with lighting conditions − and you've gotta have the load to match it EXACTLY to have efficient production. That's why there's a VARIABLE LOAD electrolyzer in the process above. When lighting conditions change, the production of hydrogen changes to match it.

This is where you lose me. A variable load electrolyzer makes sense if your DC electrical power is available to meet the load. During the daylight hours that may be the case. However, your basic problem is that there is demand for electricity at night and on rainy days, when CPV will not be generating. The other scenario, when you have more power available than you have demand is also a problem. I don't really see how your variable load electrolyzer addresses this unless it is able to store energy.

At first I didn't even understand why you would need to match hydrogen production to a load. Its a fuel. Just store some extra to get you through the down and up cycles and you should be good to go. Then I remembered that you don't plan on liquifying your hydrogen, so storing it becomes a problem. You want to set up a pipeline to the powerplant and feed them hydrogen as they need it. Makes sense since it eliminates the losses of liquifying, but then you need to supply the hydrogen when the grid needs it. What is going to happen at night? Fire up the diesel generator? Maybe the solution is liquify *some* of your hydrogen, so that you can match the load curve.

This system is simple and the hydrogen is produced at a cost that less than that of any of the fuels I compete against on a heat value basis−, coal, oil natural gas − and can burn in anything that burns them − and I can use hydrogen to make coal into petrol. The market for protons used this way, is largely unregulated and market prices for highly energetic liquids, like gasoline, are at an all time high.

What you propose is that I replace the setup above with a setup that produces electrons and sell those to people who want them. The markets for electrons are regulated, and their prices are not driven by the market as much as the prices for say crude oil.

Now logistically it seems like this would be simpler setup though;

solar panel −−> DC power

And it would be if this is all I needed. But, DC power generated at a rate that depends on lighting conditions isn't as high quality as AC power generated in response to loads.

In order to respond to loads instead of sunlight, I've got to add a SECOND power source that's independent of sunlight to my solar panel, and then shed load to that power source when the solar panel loses output and get it back when the solar power increases output. So, the actual system looks like this;

```
    solar panel -->  DC power --->  Peak power match <--  Second
Source
                                    |
                                    V
                                 DC Load
                                    |
                                    V
                                 Inverter
                                    |
                                    V
                                 AC Load
```

Now, for all intents and purposes, this second source has to be as big as the solar panel or larger to be of any use. to this sytem. When the sun isn't shining the solar panel is standing idle. When the sun is shining the second source is standing idle. So, you're adding hardware and costs and not making good use of it

And we're not done adding hardware either. Of course we don't use DC power in our power grid. We use AC power. So, we need more equipment on top of all of this to invert the DC to AC. This by itself adds $0.20 per watt or more. Recall, my system above costs less than $0.07 per peak watt.

What matters is what the other guys cost. From what I have seen, even a new coal fired generator cost a over $1.00 per watt of capacity, probably significantly more. And of course they have have to pay for their fuel, while you don't.

Now, we ALREADY have a second power source, that's already powering the AC Grid, so all we have to do is invert and tie into that right; something like this;

```
   Solar panels -->  DC Power --> Peak Power Match --> Invert --> Grid
```

This is every bit as complex as my first diagram, and the parts cost more. The peak power match and inverter (aka intertie) cost nearly $0.50 per Wp. Not too much if you're paying $5.00 per Wp for the panel, but a deal breaker when your Wp drops below $0.07.

Once again, as long as your costs remain significantly below your competition, the concept may be economically feasible. The $.07 number doesn't really matter, because for $.07 you can't produce grid ready electrical power, and this is what the consumer want to buy.

> Another thing, we still NEED the secondary power source. WE ARE NOT
> RIDDING OURSELVES OF THE RELIANCE ON FOSSIL FUELS, WE ARE CREATING
> A
> *REQUIREMENT* FOR FOSSIL FUELS.FOR OUR SYSTEM TO WORK. Which makes
> those who sell fossil fuels happy, but doesn't really help us move
> forward into a post fossil fuel age.

Unless you have a way to store your hydrogen energy, which I haven't
heard you describe, this problem exists with your plan as well.

> Also, the way people USE power, means that this will never be more
> than 15% of our total energy supply when hooked up this way. Check it
> out;
>
> Power levels flowing through the power grid are at about 50% peak
> throughout the day 24/7. About two hours before sunrise, you start to
> see power levels increase as folks wake up and turn shit on, and then
> continue to rise s they get to work and turn more shit on. There's a
> slight dip at lunch, and then a rise again, that peaks after sunset,
> when they get home and turn more shit on. It starts to fall again
> after 9 pm, to the 'baseload' level.
>
> Now, the solar panels don't produce ANY power at night. They start at
> zero near sunrise, and rise along a cosine curve until local noon is
> reached (assuming there's no clouds) and then, the cosine curve drops
> after noon, until it drops to zero again near sunset.
>
> Take the area of the solar curve and the area of the use curve, and
> divide the two, and you'll see that over the course of a day, even
> though the solar panels are producing ALL the energy being used, the
> TOTAL energy they make in a day is only 15% of all that energy that's
> consumes. − AND THE COSTS ARE HIGHER TOO.

You lost me on that one.

> Finally, in the real world of power generators, that 50% baseload
> capacity doesn't vary. Its produced baseload plants that either
> cannot vary their output much, or take days to respond to changes in
> demand. The only thing you're replacing are so called peaking plants
> − which is only half the capacity in most places. Those peaking
> plants also have limits. They can vary their output over a wide

range, but if you turn them OFF − it may take hours or days to turn back on again. In that case you have to keep the generators rolling to keep them synchronized and so forth − and to keep the boilers ready.

All this means is that you would be hard pressed to provide more than 8% of your total needs with solar power connected to the grid like this. And as a matter of fact, most utilities have sponsored legislation to limit subsidies to 4% of the total energy usage for these reasons.

I would assume that wind power has similar limits. Its production is even less predictable than solar. The weird thing is that some states are requiring something like 30% of power production should come from "alternative energy." From what you are saying the combined contribution of solar and wind to the grid could not exceed 4% without creating problems. Don't countries like Denmark have a significant percentage of their electrical energy coming from wind power? How do they deal with the issue of matching the generation to the load?

Consider it this way..

I have under construction two coal to liquid facilities that will each produce 200,000 barrels per day of petrol from low rank coal. 28,000 tons of carbon each day is directly hydrogenated by 2,500 tons of hydrogen each day at each site. To make this hydrogen I require 125 GWh of electricity each day at each site. In a year each site makes 45,656 GWh.

At these sites average insolation is 4.5 hours per day, so 28 GW of solar panels are needed at each site. The cost of the solar system is $1.9 billion. The cost of the coal conversion system is $3.5 billion. The value of 200,000 b/d of oil is worth $109 billion− NET value then is over $100 billion per site. We only need the approval of the land owner to move forward. The products we sell we sell into an unregulated market anywhere in the world.

So, over six years we've invested, including land etc., $6.5 billion and created an asset that's worth over $109 billion. That's 60% per annum rate of growth on your capital.

There are 155 electrical power companies, or electrical utilities in the United States operating 16,924 generators that have a collective capacity of 1,075 GW.

If I restrict my attention to NERC Region WECC we see that there are 26.3 GW of installed capacity. So, already just ONE of my system which I am already building is more than double to triple the size I could ever concievably put on the grid in the Mojave desert.

In terms of energy WECC's electrical energy use is 216,788 GWh per year. For reasons I've already stated only 4% of the WECC's electrical energy use could be from solar − and this s 8,671 GWh − only 20% of ONE of my sites.

Now, on the positive side I'd get wholesale generator pricing for those GWh − instead of thermal fuel pricing. So,lets look at that. Say I get $0.03 per kWh − that means I get $30,000 per GWh. That's a value at 15x earnings of $3.9 billion.

What does the system cost? Well, there's something like 2,100 hours of sunlight per year in the Mojave, so that's good. Dividing that figure into 8,671 GWh obtains 3,9 GW. Alright, now, $0.05 of the $0.07 is for the panel, so multiplying this figure by $0.05 per Wp, we obtain a total panel cost of $199 million. Not too bad. Now,we have to build an intertie (none on this scale exist) and inverters (none on this scale exist) so, I've gotta add a supply chain to that. I looked at this, andthe costs woud come out on a system this size, about $0.30 per peak watt. So, we multiply that up and obtain; $1,17 billion. Altogether $1.369 billion.

So here we have a system that might take 10 years to get approved − sells its electricity in one place − is highly regulated − costs $1.4 billion and at the end of the day, is worth maybe $4.0 billion That's a respectable 11% growth rate − but still not the kind of returns I need to OWN a large piece of the pie going forward.

Well, I guess that makes sense. You should get very rich with the hydrocarbon stuff alone, even if the "hydrogen economy" fails to materialize.

Exergy if it makes any sense at all, makes sense to an engineer trying to determine the greatest efficiencies possible for his system. I have created a very low cost solar panel technology and variable electrolysis technology. I did not produce low cost intertie, low cost inverters or anything like that. I didn't see HOW to do it. I didn't see HOW I could do something special that would put me ahead of others. So, I'm stuck with low cost solar panels and low cost electrolysis.

USING THESE − its easy to see WHY as a *business* decision − I decided to make use of hydrogen the way I did.

I have several other projects in negotiation;

(1) additional coal to liquid projects using hydrogen
(2) upgrade residual oil with hydrogen

> (3) coal replacement with hydrogen in power plants
> (4) model hydrogen economy in a small European nation

The problem with (4) is that Europe doesn't get much sun. (2) has some potential. I have a background in marine engineering. Ships are primary consumers of residual fuels. They heat the stuff and burn it in their low speed diesels. People and politicians are starting to notice that ships produce more than their share of pollution, because they burn these dirty fuels. This means pressure is going to be applied to get away from residuals. This means there is going to be a need to doe something with the residuals, and your hydrogen upgrade might be a good solution.

> Finally you spoke of acquiring land. Land may be acquired in ways that allow me to get paid for doing so. Namely, I look at sunny lands that possess other resources, but have liabilities associated with them, I am paid to take those liabilities by way of reclamation costs.

I see. That is why you have been developing open pit mines.

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